

WHAT IS CLAIMED IS:

5 1. A fiber comprising two or more lobes extending from a
central core, wherein the two or more lobes are equally spaced about an
outer periphery of the central core; wherein each lobe has a
substantially similar lobal cross-sectional configuration comprising at
least three concave portions, at least two convex portions, and at least
10 four inflection points along an outer perimeter of each lobal cross-
sectional area.

15 2. The fiber of Claim 1, wherein each lobe has a substantially
similar lobal cross-sectional configuration comprising at least three
concave portions, at least three convex portions, and at least five
inflection points along the outer perimeter of each lobal cross-sectional
area.

20 3. The fiber of Claim 1, wherein each lobe contains three
concave portions, two convex portions, and four inflection points along
the outer perimeter of the lobal cross-sectional area; wherein the
concave portions, the convex portions, and the inflection points along
the outer perimeter of the lobal cross-sectional area forms a symmetrical
pathway such that a lobe-dissecting line extending from a fiber central
axis through a central portion of the lobe dissects the lobe into two
25 substantially identical lobal portions on each side of the lobe-dissecting
line.

30 4. The fiber of Claim 3, wherein the fiber has a forked tri-
lobal fiber cross-sectional configuration, wherein each lobe comprises
only concave portions, convex portions, and inflection points in a
sequence of components comprising a first concave portion, a first
inflection point, a first convex portion, a second inflection point, a
second concave portion, a third inflection point, a second convex
portion, a fourth inflection point, and a third concave portion.

35 5. The fiber of Claim 4, wherein the fiber is substantially free
of flat surfaces along an outer perimeter of the forked tri-lobal fiber.

6. The fiber of Claim 3, wherein lines extending from inflection points located between adjacent lobes are either parallel to one another or divergent relative to one another.

5

7. The fiber of Claim 1 having a fiber cross-sectional area as shown in FIG. 1.

10

8. The fiber of Claim 2, wherein each lobe contains three concave portions, three convex portions, and five inflection points along the outer perimeter of the lobal cross-sectional area; wherein the concave portions, the convex portions, and the inflection points along the outer perimeter of the lobal cross-sectional area forms a pathway such that a lobe-dissecting line extending outward from a fiber central axis through the lobe moves in a serpentine-like pathway to a tip of the lobe.

15

20

9. The fiber of Claim 8, wherein the tip of each lobe is off-center from a straight line extending outward from a fiber central axis in a direction, which dissects an initial portion of the lobe adjacent to the central core.

25

30

10. The fiber of Claim 8, wherein the fiber has a serpentine tri-lobal fiber cross-sectional configuration, wherein each lobe comprises only concave portions, convex portions, and inflection points in a sequence of components, which comprise, starting from a left-hand side of the lobal cross-sectional area, a first convex portion, a first inflection point, a first concave portion, a second inflection point, a second convex portion, a third inflection point, a second concave portion, a fourth inflection point, a third convex portion, a fifth inflection point, and a third concave portion ending at a right-hand side of the lobal cross-sectional area.

35

11. The fiber of Claim 10, wherein a thickness of each lobe either remains the same or narrows as the lobe extends from the central core to the tip of the lobe.

12. The fiber of Claim 11, wherein the thickness of each lobe gradually narrows in thickness as the lobe gets further away from the center core.

5 13. The fiber of Claim 10, wherein the fiber is substantially free of flat surfaces along an outer perimeter of the serpentine tri-lobal fiber.

10 14. The fiber of Claim 1 having a fiber cross-sectional area as shown in FIG. 3A.

15 15. The fiber of Claim 1, wherein each lobe contains three concave portions, at least three convex portions, and at least four inflection points along the outer perimeter of the lobal cross-sectional area; wherein the concave portions, the convex portions, and the inflection points along the outer perimeter of the lobal cross-sectional area form a pathway such that a lobe-dissecting line extending outward from a fiber central axis through the lobe moves in an S-shaped pathway to a tip of the lobe.

20 16. The fiber of Claim 15, wherein the tip of each lobe is off-center from a straight line extending outward from a fiber central axis in a direction, which dissects an initial portion of the lobe adjacent to the central core.

25 17. The fiber of Claim 15, wherein the fiber has an elongated S tri-lobal fiber cross-sectional configuration, wherein each lobe comprises concave portions, convex portions, and inflection points in a sequence of components, which comprise, starting from a left-hand side of the lobal cross-sectional area, a first concave portion, a first inflection point, a first convex portion, a substantially flat section, a second convex portion, a second inflection point, a second concave portion, a third inflection point, a third convex portion, a fourth inflection point, and a third concave portion ending at a right-hand side of the lobal cross-sectional area.

30

35

18. The fiber of Claim 15, wherein a thickness of each lobe remains substantially the same as the lobe extends from the central core to the tip of the lobe.

5 19. The fiber of Claim 15, wherein a thickness of each lobe remains substantially the same as the lobe extends from the central core to the tip of the lobe except proximate the tip of the lobe, wherein a bulb is present at the tip of the lobe.

10 20. The fiber of Claim 15, wherein the fiber is has one substantially flat surface along an outer perimeter of each lobe.

15 21. The fiber of Claim 15, wherein the fiber has an elongated S tri-lobal fiber cross-sectional configuration, wherein each lobe comprises concave portions, convex portions, and inflection points in a sequence of components, which comprise, starting from a left-hand side of the lobal cross-sectional area, a first concave portion, a first inflection point, a first convex portion, a second inflection point, a second concave portion, a third inflection point, a second convex portion, a fourth inflection point, a third concave portion, a fifth inflection point, a third convex portion, a sixth inflection point, and a fourth concave portion ending at a right-hand side of the lobal cross-sectional area.

25 22. The fiber of Claim 1 having a fiber cross-sectional area as shown in FIG. 3B.

30 23. The fiber of Claim 1, wherein the fiber comprises a polyamide selected from nylon 6, nylon 6/6, nylon 6/9, nylon 6/10, nylon 6/12, nylon 11, nylon 12, and copolymers thereof.

35 24. The fiber of Claim 23, wherein the fiber comprises a monocomponent fiber comprising a single polyamide selected from nylon 6 and nylon 6/6.

25. The fiber of Claim 3, wherein the fiber has a fiber core thickness ranging from about 15.0 μm to about 18.0 μm , a minimum

thickness of lobe component (t_{min}) ranging from about 9.0 μm to about 15.0 μm , a maximum thickness of lobe component (t_{max}) ranging from about 230 μm to about 350 μm , and a length of lobe ranging from about 215 μm to about 335 μm .

5

26. The fiber of Claim 8, wherein the fiber has a fiber core thickness ranging from about 18.0 μm to about 22.0 μm , a minimum thickness of lobe component (t_{min}) ranging from about 8.0 μm to about 12.0 μm , a maximum thickness of lobe component (t_{max}) ranging from about 13.0 μm to about 19.0 μm , and a length of lobe ranging from about 43.0 μm to about 48.0 μm .

10

27. The fiber of Claim 15, wherein the fiber has a fiber core thickness ranging from about 19.0 μm to about 24.0 μm , a minimum thickness of lobe component (t_{min}) ranging from about 13.0 μm to about 18.0 μm , a maximum thickness of lobe component (t_{max}) ranging from about 13.0 μm to about 18.0 μm , and a length of lobe ranging from about 30.0 μm to about 40.0 μm .

15

28. A method of making a fiber comprising:
melt extruding a polymer through a capillary having lobe-forming extensions extending from a central portion of the capillary;

20

drawing the extruded polymer to form a drawn fiber;
quenching the drawn fiber to form a solidified resulting fiber;

25

wherein the resulting fiber has a cross-sectional configuration such that the resulting fiber contains two or more lobes extending from a central core, wherein the two or more lobes are equally spaced about an outer periphery of the central core; wherein each lobe has a substantially similar lobal cross-sectional configuration comprising at least three concave portions, at least two convex portions, and at least four inflection points along an outer perimeter of each lobal cross-sectional area.

30

29. The method of Claim 28, wherein the capillary has a capillary profile as shown in FIG. 5.

35

30. The method of Claim 28, wherein the capillary has a capillary profile as shown in FIG. 6.

5 31. The method of Claim 28, wherein the capillary has a capillary profile as shown in FIG. 7.